

Low Overhead Real-Time Computing with General Purpose Operating Systems

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This topic addresses the Software Architecture and Case Study of HPEC categories.

Abstract: Much embedded real-time computing is done with operating systems crafted from the ground up specifically for the task. In larger systems and more recently, general-purpose operating systems such as SGI IRIX and Linux are used for new projects because they already have multiprocessor and device driver support as well a large user base. Work can and has been done to improve their real-time capabilities, for example IRIX has been improved over the years to offer a number of hard real-time response time guarantees ranging from 1ms to 50us. Since general-purpose operating systems must meet the needs of a wide variety of users they are very complex which can interfere with and cause variability in the most demanding of real-time applications. My presentation deals with one method of improving the performance of these operating systems, which is by adding special low overhead interfaces to common facilities, which may be accessed entirely in user space. I will describe a number of these features including low overhead priority inversion avoiding locking methods and device I/O as well as provide performance comparisons.